

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) in Correctional Settings

By Dr. Dean Rieger, Medical Director
Indiana Department of Corrections

Staphylococcus aureus (SA) is commonly found on the skin and in the anterior nares (nostrils). Although SA usually colonizes humans without causing disease, it does cause infections that can be minor or serious and involve almost any organ in the body. SA is easily spread by direct or indirect contact with the products of infection and even by contact with the skin of a colonized person.

In county jails, people live in close contact and often have less than exemplary personal hygiene habits. Because of the close living conditions and the high client turnover, furnishings and linens may be shared without having been cleaned well enough to kill SA that may be present. It is not surprising that county jails are settings in which SA outbreaks are common.

SA skin infections typically begin as small erythematous patches, usually in a follicular pattern or in small breaks in the skin, and progress to become tiny pustules. The exudates in these pustules, if cultured, will grow SA. The infection may progress to one or more abscesses, may spread locally, or may penetrate tissue and become systemic.

In addition to a varying sensitivity to antimicrobials, SA exhibits virulence that varies broadly. Most SA is not especially virulent and lives commensally on the skin, only causing infection in an opportunistic but non-aggressive manner. Some SA, however, is extremely virulent and can progress from a trivial skin infection to full blown sepsis in a matter of hours or days. Many factors affect this, some belonging to the host and others to SA itself. SA is famously known for its toxins, one of which causes toxic shock syndrome. When managing patients in a single facility, whether in response to endemic or outbreak presentations, the attending health care professionals must consider virulence when determining how aggressively to treat SA infections.

Methicillin resistance is an issue commonly addressed with SA. However, SA must be addressed whether or not the SA found in a facility exhibits resistance to methicillin. Methicillin resistance is a characteristic separate from virulence. Both resistance profiles and virulence must be considered when determining how a patient or an outbreak should be managed.

Methicillin resistant SA, or MRSA, first became common in hospital settings in the 1960s when methicillin was the antibiotic of last resort for treating SA infections. Within a few decades of the appearance of MRSA, in some hospitals, it had become the most common SA isolate. Vancomycin took over methicillin's role as the antibiotic of last resort and then, not surprisingly, vancomycin-resistant (VRSA) and vancomycin intermediate-resistant (VISA) strains began to appear. Currently, isolation of either VRSA or VISA is a rare event. During this same period, several other strains of SA independently developed resistance to methicillin. Three distinct strains of community-associated MRSA (CA-MRSA) have been identified, and these CA-MRSAs are notable because they retain sensitivity to one or more common antibiotics, including trimethoprim-sulfamethoxazole (Bactrim, Septra) and tetracyclines. Except for their antimicrobial sensitivities, none of the SA strains is clinically distinguishable from each other.

The information below is directed toward the prevention and management of CA-MRSA outbreaks and will not address individual treatment of patients with CA-MRSA infections beyond noting that the same considerations that have pertained to treatment of SA during the antibiotic era are still true. Trivial skin infections can usually be managed without antibiotics. More serious infections may require antibiotics, incision and drainage, inpatient care, and so on. Standard antibiotic therapy may be augmented with rifampin, but rifampin must not be used as monotherapy because of the simplicity and speed with which resistance develops.

CA-MRSA should be considered endemic in jail settings, and sporadic cases should be expected. When CA-MRSA infections occur more than occasionally, prevention and management of CA-MRSA outbreaks require recognition and understanding of the CA-MRSA problem, treatment of cases that are likely sources of transmission; and, perhaps most importantly, attention to the environment.

It may seem obvious to emphasize the importance of the recognition of an outbreak, but in many jails, outbreaks have continued for long periods without either the jail operations staff or health services personnel realizing it. Jails are short-stay facilities, and it is not uncommon for an inmate with a skin infection to leave jail without ever mentioning the infection to jail personnel. The typical presentation of CA-MRSA in jails -- single or multiple reddish spots on the lower extremities -- has often been misinterpreted as an epidemic of spider bites. Not surprisingly, attempts at spider and insect control fail to terminate the outbreak. Until the skin infections are recognized as likely SA infections, the outbreak is likely to go unrecognized.

Once an outbreak is suspected, only culture with determination of the antimicrobial sensitivity pattern will permit a reliable diagnosis of SA or CA-MRSA. (Theoretically, an outbreak can be caused by hospital-acquired MRSA, or even VISA/VRSA. If a jail facility has VISA/VRSA, expert consultation should be sought from the health department.) Once the outbreak is recognized and the antibiotic sensitivity pattern established, it is not necessary to culture every patient, although those with aggressive infections or weakened immunity should be cultured. Empirical treatment is generally reasonable, even for those who require oral antibiotics.

Some practitioners feel that it is appropriate to try to eradicate not only infection, but also colonization. This is a well-intentioned but misguided approach to outbreak management. Treatment with antimicrobials applies a strong (albeit brief) selection pressure and can encourage the development of a strain that is either relatively or completely resistant to the antimicrobial in use, and viable bacteria shed during the initial treatment are more likely to be resistant than they would be otherwise. Shedding organisms with intermediate resistance is likely both from colonized and infected patients. Eradication of colonization is reasonable when an individual patient has repeatedly failed treatment for CA-MRSA, or when there are specific host factors that make any CA-MRSA infection especially dangerous. Eradication of carriage in the nares, when necessary, can be accomplished with mupirocin calcium 2% ointment (Bactroban).

For prevention or termination of an outbreak, it is important to understand how SA survives in the environment and how it is transmitted. This understanding is critical to determining how transmission can be interrupted and how an outbreak can be terminated. SA thrives in warm and moist environments. As it dries out, it dies. The key to reducing transmission between prisoners is reducing the bacterial load in the environment and interrupting potential contacts between prisoners and bacteria.

Inspect the facility to make sure that obvious opportunities for contact are interrupted. Eliminate shared towels in bathrooms, kitchens, laundry areas, workshops, or other locations.

- Implement terminal disinfection procedures when one prisoner leaves a housing area and another enters it. Clean the fixtures, the mattresses, the furniture, and so on. Discard objects that cannot be disinfected properly.
- Make sure that all cleaning solutions are properly bactericidal. This usually means that products containing quaternary ammonium compounds should be used, taking care to dilute in accordance with the manufacturer's recommendations. Solutions that are too dilute will often make the surface visually clean but will fail both to kill bacteria on contact and to leave a killing residuum.
- Review practices in recreation areas, such as weight rooms. Health clubs provide spray bottles of antimicrobial solutions for use in cleaning weight machines between users and so should jails.
- Review practices in booking areas. Simple plastic benches, for example, can become vectors for transmission. Frequent cleaning with solutions that leave a killing film can help stop this.
- Bathrooms should be cleaned regularly, using appropriately bactericidal products. Toilet seats should receive the same treatment between users as weight machines.
- Laundry facilities should be reviewed and inspected. Is the detergent bactericidal? Do the washer and/or dryer reach proper killing temperatures? Is laundry dried or brought out still cool and moist? Commercial laundries periodically test their processes to make sure that bacteria are killed and so should jails.
- Identified CA-MRSA patients, especially those with draining wounds, can produce huge quantities of bacteria and deposit them in the environment. Patients with draining wounds should be required to control their secretions. If they cannot or if they refuse to, separation from the general population or even formal isolation may be appropriate.
- The two primary populations of the jail, prisoners and personnel, should be educated regarding CA-MRSA. They need to understand both how to protect themselves from transmission and how to recognize a SA infection. Early intervention for those infected is vital for decreasing the environmental load of SA bacteria.
- Personal hygiene, most importantly frequent hand washing, is critical for interrupting transmission. This applies not only to the prisoners but also to health services employees.
- Eliminating barriers to health care access is important. Co-pay requirements are an important tool for controlling unnecessary or abusive health services requests, but to the extent that they stop infected prisoners from seeking health services, they may prolong an outbreak.

It is not possible to anticipate every means through which CA-MRSA can be transmitted nor every corrective or preventive measure that can help stop an outbreak or prevent an outbreak from occurring. That is why those working with the county jails must understand the nature of SA and its transmission and individualize their approaches.

Just as it is critical to identify an outbreak when it occurs, it is similarly important to monitor outbreaks so that the administrative staff can determine whether or not control measures are effective. Outbreaks cannot be managed through impressions and memories. Cases should be documented and logged, and at least minimal descriptions should be maintained for each case. This will permit the facility staff not only to determine if an outbreak is getting worse, staying the same, or disappearing, but will also provide evidence upon which the local CA-MRSA strain's virulence can be gauged.

These approaches have been used in short- and long-term facilities with success. They work. Outbreaks have been terminated within a month of identification and initiation of proper environmental sanitation. Facilities would be well advised to review their practices in advance of identifying any outbreaks, as environmental measures can prevent outbreaks from occurring.

Eliminating the occurrence of CA-MRSA in jails is impossible. CA-MRSA is now widespread in the community at large, and even if it were eliminated from any single county jail, it would very likely be reintroduced within a few days. When the human immunodeficiency virus was first identified and discovered to be more prevalent in jails than in other settings, jail personnel entered a period of near panic, afraid of infection. With time and the establishment and acceptance of universal precautions, jail personnel learned that, with proper care, the risk of becoming infected could be reduced nearly to zero. CA-MRSA engenders the same type of fear. SA has done this before with toxic shock syndrome. Like these earlier SA panics, CA-MRSA will become something that we understand and live with. The key tools remain: understanding how the bacteria survive and spread, and how we can interrupt that process.

CA-MRSA outbreaks in correctional settings should be reported to the local health department or to the Indiana State Department of Health, Epidemiology Resource Center, at 317/233-7125.
